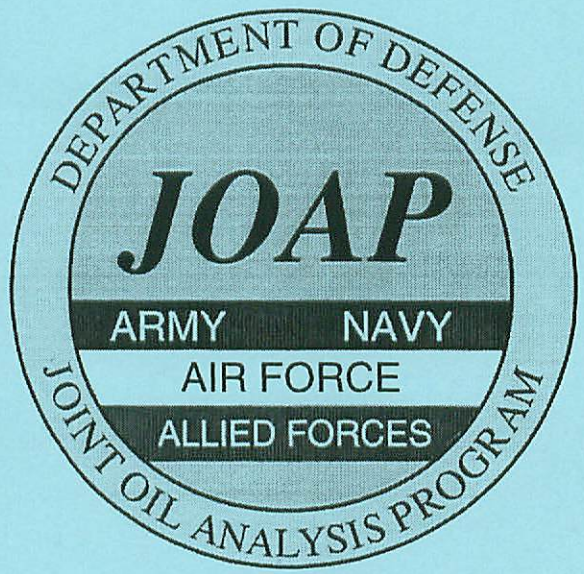
JOAP-TSC-FE-02-01

Field Demonstration of the Suitability of JOAP Spectrometric Standards Produced From VHG Concentrates



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This report has been reviewed by the undersigned and is approved for publication in accordance with the Joint Regulation and JOAP-TSC charter.

David Broxterman, LtCol, USAF
Director, JOAP-TSC

REPORT DOCUMENTATION PAGE

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14. ABSTRACT
Reports results of an effort to demonstrate the suitability of VHG-based JOAP spectrometric standards for standardizing field laboratory spectrometers employed in the routine analysis of used oils.

15. SUBJECT TERMS
JOAP, JOAP-TSC, ATOMIC EMISSION SPECTROMETER, AES, OIL ANALYSIS, CALIBRATION, STANDARDIZATION

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Field Demonstration of the Suitability of JOAP Spectrometric Standards Produced From VHG Concentrates

1. **Purpose.** To demonstrate the suitability of VHG-based JOAP spectrometric standards for standardizing field laboratory spectrometers employed in the routine analysis of used oils.

2. **Attachments.**

   a. Summary of results.

   b. Used oil analysis readings for each laboratory.

   c. Instructions provided by JOAP for performing the test.

3. **Background.**

   a. The JOAP manufactures the spectrometric oil standards used for both calibration and daily standardization of all DoD atomic emission spectrometers used for JOAP purposes. In the past, all of the single element metallo-organic concentrates used to produce JOAP standards were purchased from CONOSTAN, a sole source supplier. Recently, CONOSTAN elected to discontinue selling the concentrates to outside organizations. As a result, it has become necessary to establish a new supplier of concentrates.

   b. Pursuant to a preliminary screening of possible suppliers, VHG Labs, Inc. was chosen as the first supplier of concentrates to undergo extensive testing. After several months of rigorous testing, the JOAP concludes that introducing VHG concentrates into the production process has no observable impact.

   c. Part of the testing performed by the JOAP involved analyzing used oil on a spectrometer configured in each of the four possible combinations of CONOSTAN and VHG-based standards for calibration and standardization. The test proved conclusively that spectrometer tolerance is not affected by using VHG-based standards.

   d. The JOAP Coordinating Group (CG), comprising the managers/directors of the service-specific branches of JOAP, requested a small demonstration of the suitability of the new VHG-based standards. The demonstration, to be performed by chosen field laboratories among the three services, would bolster field confidence in the new standards. The implementation and results of the demonstration are the subject of this report.

4. **Discussion.**

   a. The JOAP CG chose thirteen laboratories to participate. They are listed in attachment A. For each laboratory, the JOAP prepared a package containing a set of VHG-based standards, a correlation kit from a previous month, instructions (Attachment C), a data capture diskette, and a pre-addressed return mailer. The packages were mailed in mid May 2002, giving the laboratories a suspense of 14 June 2002.

   b. The data capture diskette contained an Excel spreadsheet that gave operators instant feedback on the results. If the two readings on a particular element for a used-oil sample differed by more than 20% and the difference was greater than 1, the pair of readings was marked in red font. The allowed difference of 20% roughly reflects the tightest, element tolerance range of the instrument. If there were more than 15 pairs of readings (20% of total pairs) marked red, the difference between the standardizations would be considered significant and an overall failure would be indicated. This requirement, that at least 80% of the pairs compare tolerably, corresponds roughly to accepted JOAP practice in scoring correlations.

   c. Fort Carson withdrew from the demonstration due to scheduling conflicts. Fallon experienced instrument problems that could not be resolved after several attempts. The operator could not get the instrument to standardize on the supplied VHG-based standards. They returned the standards and a JOAP chemist successfully standardized a JOAP instrument using the returned standards, then successfully completed the test.

   d. Of the eleven laboratories successfully completing the demonstration, nine had correlation scores in the 90's and two in the 80's. None exhibited a significant difference between the regular and VHG-based standardizations when compared as explained in 4.b, above. Of the 825 pairs compared, only 21 were marked red. No laboratory had more than 5 red pairs. In attachment B the red pairs are actually bold faced.

5. **Conclusion.** The field demonstration described should help allay any anxiety about transitioning to VHG-based standards. It has established easy-to-understand evidence that VHG-based standards are indeed suitable for field use.

USED OIL DEMO SUMMARY

Lab	Received	Run	Correlation	Results	Comments
Ft. Campbell	31 May 2002	29 May 2002	94 1&2: R1: Al 3&4: R1: B	NSD	
Roosevelt Roads	13 Jun 2002	10 Jun 2002	97 3&4: R2: Zn	NSD	
Davis-Monthan	13 Jun 2002	12 Jun 2002	97 3&4: R1: Zn	NSD	
Spangdahlem	14 Jun 2002	30 May 2002	94 1&2: R1: Si 3&4: R1: Si	NSD	
Keflavik	17 Jun 2002	13 Jun 2002	93 1&2: R2: Na, Ni	NSD	
Pearl Harbor	21 Jun 2002	20 Jun 2002	90 1&2: R2: Ti; R3: Pb 3&4: R2: Pb	NSD	
OSAN	24 Jun 2002	12 Jun 2002	80 1&2: R2: Na; R3: Fe 3&4: R1: Pb; R2: Na, Si, Zn	NSD	
Norfolk	2 Jul 2002	20 Jun 2002	93 1&2: R3: B 3&4: R1: B	NSD	
Key West	3 Jul 2002	3 Jul 2002	87 3&4: R1: Fe; R2: Cu, Sn; R3: Na	NSD	
San Diego	8 Jul 2002	27 Jun 2002	94 1&2: R1: Na 3&4: R2: Mo	NSD	
Andersen	29 Jul 2002		97 3&4: Na (R1)	NSD	Did not submit forms
Fallon					Inst. Problems
Ft. Carson					Withdrawn

NSD - No Significant Difference

Data for Ft. Campbell

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	2.3	0.0	0.0	0.0	0.6	2.4	1.3	0.0	0.0	2.4	4.3	0.3	0.0	0.0	2.5
2	0.2	0.0	0.2	0.0	0.0	0.0	0.4	0.0	0.0	0.7	1.1	0.6	1.6	0.0	0.0
3	1.1	0.0	0.3	0.1	0.1	0.8	1.2	0.0	0.9	2.5	1.4	0.4	2.5	0.0	1.8
4	25.7	2.7	2.8	0.4	801.0	11.7	9.7	0.1	10.2	5.5	0.0	0.0	129.0	107.0	716.0
5	42.8	1.1	11.3	0.2	479.0	422.0	18.9	1.9	15.6	7.1	0.0	0.0	47.0	10.4	1334.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	2.1	0.0	0.2	0.0	0.5	2.4	1.3	0.0	0.0	2.3	3.6	0.7	0.1	0.0	1.9
2	0.3	0.0	0.1	0.0	0.0	0.0	0.5	0.1	0.0	0.5	1.4	0.6	1.7	0.0	0.1
3	1.3	0.1	0.4	0.0	0.1	1.0	1.6	0.0	0.5	2.6	1.2	0.8	2.6	0.0	1.9
4	22.5	2.5	2.5	0.2	687.0	10.7	10.0	0.5	8.7	5.1	0.0	0.0	125.0	108.0	672.0
5	40.6	1.2	11.0	0.3	465.0	432.0	20.2	2.4	14.3	6.3	0.0	0.0	49.5	11.8	1341.0

Data for Roosevelt Roads

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	**4.9**	0.6	0.6	0.4	1.7	**2.5**	**1.7**	1.2	0.0	**5.9**	4.3	0.2	0.0	0.0	24.9
2	4.4	0.0	0.9	0.4	0.1	0.9	0.0	0.0	0.0	1.3	5.1	0.3	0.0	*0.0*	*0.0*
3	14.6	0.0	0.3	0.2	0.1	1.4	0.0	0.0	0.0	0.8	3.9	0.2	0.0	0.0	0.1
4	1.5	0.0	1.4	0.1	0.4	0.5	0.0	0.0	0.0	1.6	4.1	0.2	0.0	0.0	0.0
5	7.6	0.0	0.4	0.4	0.7	1.3	0.0	0.4	0.0	3.0	**5.1**	0.3	0.0	0.0	4.2

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	**8.5**	1.2	1.0	0.5	2.2	**4.0**	**5.0**	1.8	0.0	**9.1**	3.6	0.1	0.0	0.0	27.7
2	3.9	0.0	0.9	0.4	0.1	0.8	0.0	0.0	0.0	1.7	4.6	0.3	0.0	0.0	0.0
3	13.8	0.0	0.3	0.2	0.1	1.3	0.0	0.0	0.0	0.6	4.3	0.2	0.0	0.0	0.1
4	1.5	0.0	1.3	0.0	0.4	0.4	0.0	0.0	0.0	1.2	3.9	0.1	0.0	0.0	0.0
5	7.6	0.0	0.2	0.4	0.7	1.3	0.0	0.4	0.0	3.3	**3.9**	0.4	0.0	0.0	4.4

Data for Monthan

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	1.0	0.0	0.0	0.0	2.0	**3.0**	0.0	0.0	0.0	1.0	**4.0**	0.0	0.0	0.0	9.0
2	13.0	0.0	3.0	0.0	8.0	7.0	0.0	0.0	0.0	8.0	5.0	0.0	0.0	0.0	0.0
3	18.0	0.0	13.0	0.0	33.0	3.0	2.0	0.0	0.0	45.0	8.0	0.0	0.0	0.0	5.0
4	11.0	0.0	2.0	1.0	0.0	1.0	0.0	0.0	0.0	**3.0**	6.0	0.0	0.0	0.0	0.0
5	**4.0**	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	**1.0**	5.0	0.0	0.0	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	1.0	0.0	0.0	0.0	2.0	**2.0**	0.0	0.0	0.0	1.0	**5.0**	0.0	0.0	0.0	9.0
2	13.0	0.0	3.0	0.0	8.0	7.0	0.0	0.0	0.0	8.0	6.0	0.0	0.0	0.0	0.0
3	19.0	0.0	13.0	0.0	34.0	3.0	2.0	0.0	0.0	46.0	8.0	0.0	0.0	0.0	6.0
4	12.0	0.0	2.0	1.0	0.0	1.0	0.0	0.0	0.0	**4.0**	5.0	0.0	0.0	0.0	0.0
5	**3.0**	0.0	1.0	0.0	0.0	0.0	0.0	0.0	0.0	**0.0**	5.0	0.0	0.0	0.0	0.0

Data for Spangdahlem

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.3	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.0	2.0	0.2	0.0	0.0	0.0
2	0.9	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.0	0.0	**3.0**	0.7	*0.0*	*0.0*	*0.0*
3	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	**3.0**	0.7	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.4	0.0	0.4	0.0	0.0	**0.0**	2.6	0.3	0.0	0.0	0.0
5	0.7	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.2	3.1	0.4	0.0	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	2.5	0.5	0.0	0.0	0.0
2	0.8	0.1	0.0	0.0	0.8	0.0	0.0	0.0	0.1	0.0	**1.8**	0.4	0.0	0.0	0.0
3	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	**1.8**	0.0	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.5	0.0	0.3	0.0	0.0	**3.8**	3.2	0.2	0.0	0.0	0.0
5	0.4	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	2.3	0.2	0.0	0.0	0.0

Data for Keflavick

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.4	6.0	0.0	0.0	0.0	0.0
2	0.2	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.3	**5.5**	0.4	*0.1*	*0.2*	0.0
3	0.1	0.0	0.0	0.1	0.1	0.0	0.0	0.0	0.0	0.2	**5.5**	0.1	0.0	0.1	0.0
4	154.0	0.1	14.2	4.3	29.4	288.0	46.5	3.0	27.0	35.2	0.0	0.0	34.9	48.3	916.0
5	0.3	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.4	5.1	0.8	0.0	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	5.2	0.0	0.2	0.0	0.0
2	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	**3.9**	0.0	0.0	0.0	0.0
3	0.1	0.0	0.1	0.2	0.0	0.0	0.0	0.0	0.0	0.0	**6.7**	0.0	0.0	0.0	0.0
4	138.0	0.0	13.1	3.7	27.4	271.0	41.7	2.5	24.7	33.0	0.0	0.0	36.0	46.7	783.0
5	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.1	4.5	0.0	0.1	0.3	0.0

Data for Pearl Harbor

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	249.0	0.0	11.2	12.3	16.5	48.9	12.5	6.7	36.1	89.7	12.0	0.0	48.4	126.0	795.0
2	22.8	0.1	0.4	0.3	256.0	11.7	27.1	0.2	291.0	2.9	0.0	0.0	4.9	0.5	987.0
3	20.6	0.3	1.4	0.3	1.4	9.3	0.0	0.3	0.0	**1.3**	3.8	0.6	0.0	0.0	0.3
4	0.9	0.0	0.1	0.0	0.0	2.7	7.2	0.0	0.0	3.1	0.0	0.0	84.4	0.3	6.0
5	171.0	0.1	7.4	7.0	12.8	105.0	21.6	3.4	22.5	40.4	8.5	0.0	68.8	**121.0**	806.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	244.0	0.0	11.4	11.7	15.6	48.1	11.6	6.4	35.6	86.5	11.4	0.0	50.3	147.0	773.0
2	23.3	0.0	0.5	0.1	266.0	11.3	23.8	0.0	291.0	2.0	0.0	0.0	5.2	0.1	1003.0
3	18.1	0.1	0.5	0.2	1.2	8.4	0.0	0.0	0.0	**0.3**	4.2	0.4	0.0	0.0	0.2
4	0.9	0.0	0.0	0.1	0.0	2.4	7.2	0.0	0.4	3.0	0.0	0.0	85.2	0.0	6.5
5	175.0	0.0	6.6	6.4	12.9	111.0	20.2	3.2	22.2	38.7	8.6	0.0	73.1	**146.0**	920.0

Data for OSAN

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.9	4.8	0.2	0.1	0.0	0.0
2	0.0	0.0	0.0	0.0	0.4	0.0	0.0	0.0	0.0	3.0	**4.3**	0.2	0.6	0.0	0.0
3	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	2.9	0.1	0.1	0.0	0.0
4	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	2.4	4.0	0.7	0.0	0.0	0.0
5	0.3	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.3	**4.1**	0.6	0.0	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	4.8	0.1	0.0	0.0	0.0
2	0.2	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	3.1	**2.9**	0.5	0.5	0.0	0.0
3	0.0	0.0	0.0	0.0	0.3	0.0	0.0	0.0	0.0	0.4	3.6	0.1	0.0	0.0	0.0
4	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	2.2	4.8	0.1	0.1	0.0	0.0
5	0.1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.0	1.1	**3.1**	0.5	0.1	0.0	0.0

Data for Norfolk

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	17.6	0.0	1.9	3.6	12.1	21.6	9.2	0.3	1.3	7.2	0.0	0.0	2.7	0.2	394.0
2	38.1	0.0	6.4	3.6	10.3	23.2	29.8	0.6	1.1	14.7	0.0	0.0	3.3	0.5	396.0
3	21.2	0.0	1.6	0.3	4.7	21.6	11.1	0.3	1.6	8.5	0.0	0.0	3.0	0.2	400.0
4	8.7	0.0	3.0	0.4	2.6	24.7	11.0	0.3	0.9	5.2	0.0	0.0	0.6	0.0	447.0
5	4.2	0.0	1.3	0.2	0.8	20.9	6.5	0.3	0.3	7.3	0.0	0.0	0.6	0.1	384.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	16.3	0.0	1.7	3.6	12.0	19.3	9.4	0.1	1.7	7.7	0.0	0.0	2.5	0.3	363.0
2	40.9	0.0	6.7	3.7	11.1	24.0	32.3	0.4	1.1	15.5	0.0	0.0	3.4	0.4	387.0
3	20.3	0.0	1.7	0.5	4.8	20.1	12.1	0.2	1.8	8.1	0.0	0.0	2.8	0.4	389.0
4	7.6	0.0	3.0	0.6	2.5	21.3	11.3	0.2	1.2	4.7	0.0	0.0	0.6	0.2	403.0
5	4.4	0.0	1.3	0.3	0.4	20.6	6.4	0.0	0.4	7.1	0.0	0.0	0.6	0.4	387.0

Data for Key West

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.0	0.1	0.0	2.3	0.0	0.0	0.1	4.0	0.3	0.1	0.0	0.0
2	0.3	0.0	0.0	0.0	0.1	0.0	2.2	0.0	0.0	0.3	4.7	0.5	0.1	0.0	0.0
3	0.0	0.0	0.0	0.0	0.0	0.0	1.5	0.0	0.0	1.8	4.3	0.4	0.0	0.0	0.0
4	0.0	0.0	0.0	0.0	0.1	0.0	2.1	0.0	0.0	0.6	4.0	0.4	0.1	0.0	0.0
5	0.2	0.0	0.0	0.0	0.1	0.2	2.7	0.0	0.0	1.7	5.0	0.4	0.1	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.2	0.0	0.0	0.0	0.2	0.1	2.4	0.2	0.0	0.5	4.1	0.8	0.0	0.0	0.0
2	0.2	0.0	0.0	0.0	0.1	0.1	2.5	0.0	0.0	0.5	4.0	0.7	0.0	0.0	0.0
3	0.1	0.0	0.0	0.0	0.1	0.0	1.5	0.1	0.0	1.2	4.3	0.6	0.0	0.0	0.0
4	0.2	0.0	0.0	0.0	0.0	0.0	2.0	0.0	0.0	0.4	3.7	0.7	0.1	0.0	0.0
5	0.3	0.0	0.0	0.0	0.1	0.1	2.8	0.0	0.0	0.8	4.2	0.7	0.0	0.0	0.0

Data for San Diego

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	1.1	0.0	0.7	0.2	0.0	0.0	0.0	0.0	0.0	0.0	5.3	0.3	0.1	0.0	0.0
2	8.3	0.2	1.2	0.7	0.3	1.4	0.0	0.1	0.0	0.0	6.5	0.4	0.0	0.0	0.0
3	4.0	0.1	1.2	0.8	0.3	0.0	0.0	0.0	0.0	0.6	**6.2**	0.4	0.0	0.0	0.0
4	8.9	0.1	0.9	1.6	0.2	0.3	0.0	0.5	0.0	0.8	6.4	0.5	0.0	0.0	0.0
5	10.1	0.2	1.1	0.9	0.2	0.6	0.0	0.2	0.0	1.5	5.4	0.0	0.0	0.0	0.0

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	1.1	0.0	0.6	0.2	0.0	0.0	0.0	0.0	0.0	0.0	5.9	0.2	0.0	0.0	0.0
2	8.2	0.2	1.3	0.7	0.3	1.5	0.0	0.0	0.0	0.9	5.4	0.2	0.0	0.0	0.0
3	4.1	0.1	1.2	0.7	0.3	0.0	0.0	0.0	0.0	0.4	**4.7**	0.1	0.0	0.0	0.0
4	8.9	0.1	0.9	1.5	0.2	0.2	0.0	0.3	0.0	0.6	6.0	0.3	0.0	0.0	0.0
5	10.4	0.2	1.3	1.0	0.2	0.7	0.0	0.1	0.0	2.0	5.2	0.2	0.0	0.0	0.0

Data for Andersen

Conostan-based Standardization (C values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.1	0.0	0.0	0.1	0.0	0.1	0.0
2	5.6	5.1	5.1	5.1	5.5	5.4	5.1	5.0	**6.9**	6.1	6.5	5.4	0.0	0.0	0.0
3	10.7	11.0	9.9	9.8	10.4	11.1	10.6	10.7	11.0	10.4	10.9	9.9	0.0	0.0	0.0
4	30.5	30.8	29.9	30.7	29.1	30.7	31.8	31.1	28.6	32.8	30.4	29.9	0.0	0.0	0.0
5	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0	0.1	0.0	2.1	0.0	94.7	92.3	90.6

VHG-based Standardization (V values):

Sample	Fe	Ag	Al	Cr	Cu	Mg	Na	Ni	Pb	Si	Sn	Ti	B	Mo	Zn
1	0.0	0.0	0.0	0.1	0.0	0.0	0.0	0.2	0.0	0.0	0.0	0.0	0.0	0.0	0.0
2	5.7	4.9	5.1	5.1	5.5	6.0	5.7	5.4	**5.5**	5.8	5.8	5.3	0.2	0.0	0.0
3	10.7	10.8	9.9	9.9	10.9	11.0	11.0	10.9	10.7	9.5	10.5	9.4	0.3	0.0	0.2
4	32.5	32.9	31.4	31.8	32.2	32.3	33.3	31.8	32.2	34.2	31.9	31.5	0.8	0.0	0.3
5	0.1	0.1	0.1	0.0	0.0	0.1	0.3	0.1	0.0	0.1	2.4	0.0	101.0	104.0	95.9

Used-Oil Demonstration – Field Procedures

1. **Background**. Conostan has supplied concentrates for the manufacture of JOAP oil standards since the program's inception. Recently, Conostan decided to stop supplying the concentrates. In response, the JOAP TSC has undertaken the task of establishing a new supplier for concentrates. VHG has submitted concentrates for testing in hopes of becoming the new supplier. To ensure the introduction of VHG concentrates into the process does not adversely impact the JOAP, the JOAP TSC has done extensive testing in-house. This testing demonstrated that the change to VHG would not have a negative effect on the program. The JOAP Coordination Group commission the JOAP Technical Support Center to conduct a "field check" to validate the seamless transition of the VHG-based standards to the field. Your lab was selected by the program office to perform the field check.

2. **Procedure**. To minimize the influence of unwanted variables in the field check results, it is important to perform the procedures exactly as stated. The same operator must perform this procedure completely in one day. Multi-spectrometer labs must run the procedure on one spectrometer. The spectrometer must be connected to a working printer. Air Force labs must use AETC software. Use aluminum boats for standardization and disc offset procedures. An addressed envelope is included for submitting all printouts and completed forms at the completion of this test. Also, the VHG-based standards have not been approved for routine use, see 2.13 for return instructions. The results should be submitted NLT 14 June 2002. If any of the above requirements cannot be met, or if any of the procedures have unexpected results, contact Robert Martin, 850-452-3191x104, or Tim Yarborough, x119. In the following procedure, C denotes Conostan-based standards routinely used by the lab and V denotes the provided VHG-based standards.

2.1. Complete form 1.

2.2. Select 5 routine lab samples with enough oil for more than 2 burns.

2.3. Clean vent filter and perform the optical profile procedure. If necessary, repeat the optical profile procedure until all optimal values are within three lines of each other.

2.4. Perform the disc-offset procedure and print the results.

2.5. Perform a complete standardization with C standards; include a standardization check, as usual. Print the results. If the machine cannot be standardized successfully, discontinue this test.

2.6. Analyze the 5 selected samples (one burn each), printing each burn.

2.7. Perform a standardization check with an appropriate C standard and print the results.

2.8. Perform a complete standardization with V standards; include a standardization check, as usual. Print the results. Note: use the same D19-0 standard as in step 2.5;

the D19-0 standards are not going to change. If the machine cannot be standardized successfully, discontinue this test.

2.9. Analyze the correlation samples provided. Fill out the correlation results card and submit it with the rest of the package.

2.10. Analyze the 5 selected samples (one burn each) in the exact same order as step 2.5. Print the results.

2.11. Perform a standardization check with an appropriate V standard and print the results.

2.12. A diskette is provided that includes an Excel spreadsheet named demo.xls. Open demo.xls and enter the burn data from the two analytical runs. Save the spreadsheet back to demo.xls. The spreadsheet will highlight problem areas in your data if Excel is configured to allow macros. Otherwise, you will simply get the pass/fail indication. Notice the spreadsheet will provide instant feedback as to the success or failure of the field check once the data is entered. If a failure is indicated, contact the JOAP-TSC POC listed above for further instruction.

2.13. Make copies of the printouts and completed forms, and then submit the originals in the provided addressed envelope. Return the unused portion of the V standards in the original canisters; tape the canisters securely and use the original packaging affixing the provided pre-addressed label. Fill in form 2 to ensure you have included everything necessary; form 2 should also be submitted.

2.14. Retain the remaining samples for at least 2 weeks.

Used-Oil Demonstration – Form 1

Date of Test: _____

Operator Name: _____

Operator Phone: _____

Batch numbers for Conostan-based standards used:

D19-0 _____

D12-3 _____

D12-100 _____

Lot and batch numbers for disc electrodes used: _____

Lot and batch numbers for rod electrodes used: _____

Used-Oil Demonstration – Form 2

Submission Package Checklist

- ❑ Completed forms 1 & 2
- ❑ Optical profile printout
- ❑ Disc offset printout
- ❑ Printout of standardization with C standards
- ❑ Printout of standardization with V standards
- ❑ Printouts of all check burns
- ❑ Printout for each used-oil burn.
- ❑ Printout of all correlation burns
- ❑ Completed correlation data card.
- ❑ Diskette containing filled in spreadsheet.
- ❑ Unused portion of V standards.